

# **Dixie Valley Doe Research Workshop**

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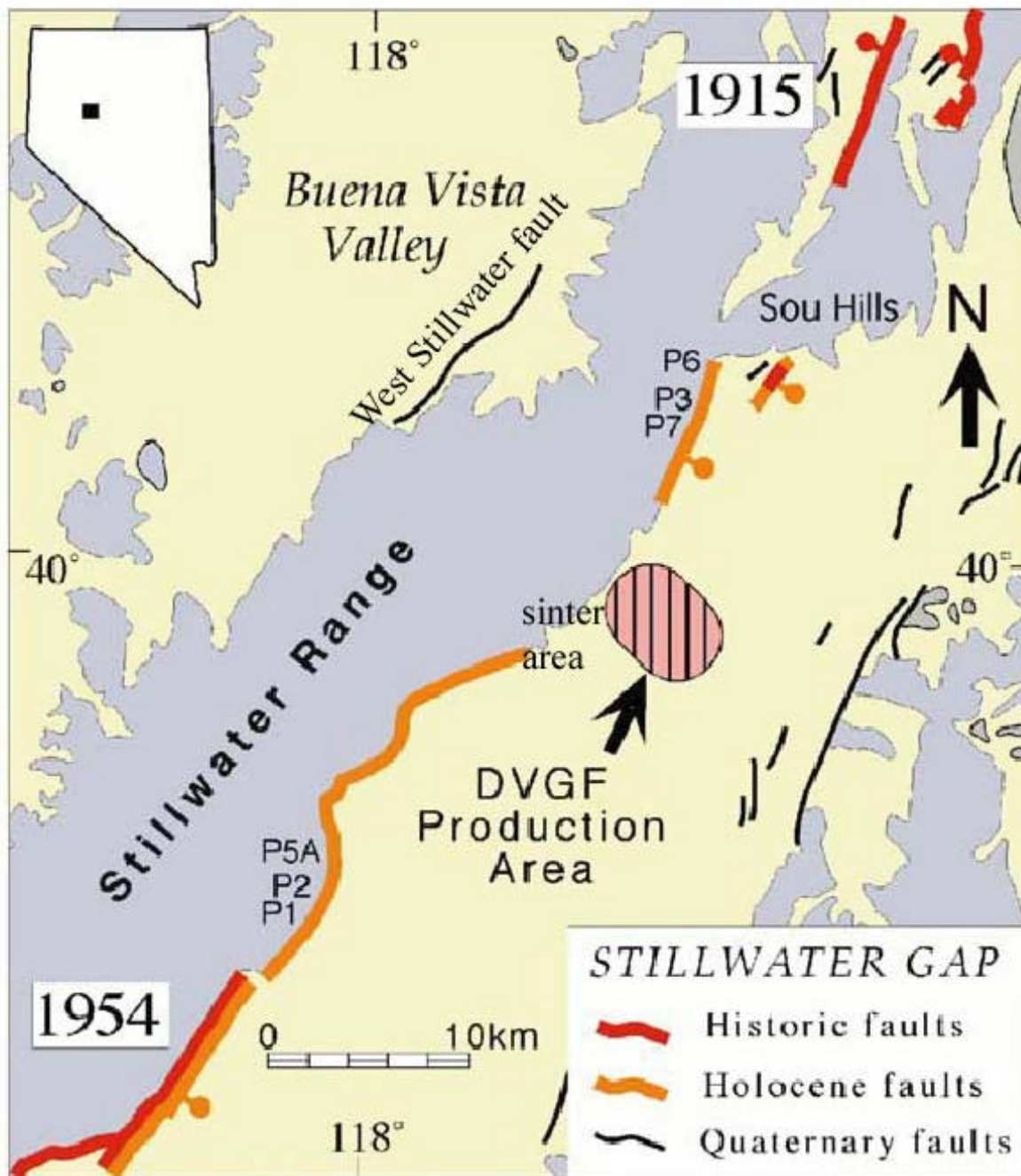


# Why are we here today?

- Clean Energy Source
- Renewable Energy Source
- Indigenous Energy Source
- Cost Effective Energy Source





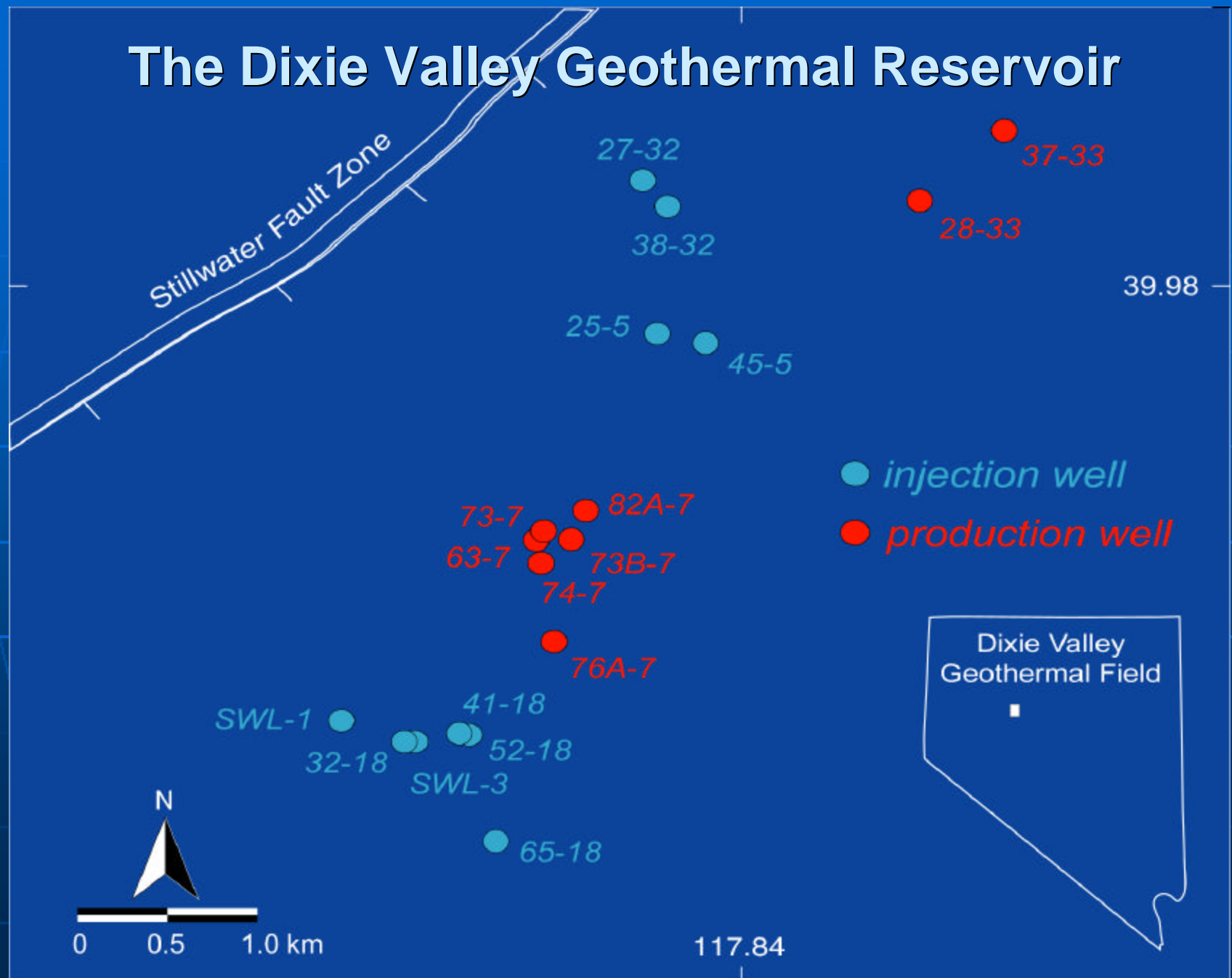


# Project Setting

- 62 MW gross generation design
- Dual Flash Turbine
  - HP Steam 90 psia
  - LP Steam 20 psia
- Production of 5200 kph mass flow
- Production Temperature near 465 °F
- Reinjection has averaged near 82% of Production



# The Dixie Valley Geothermal Reservoir



# Current Production Well Distribution

- 2 Section 33 Producers      2000 kph
  - 28-33
  - 37-33
- 5 Section 7 Producers      3200 kph
  - 63-7
  - 73-7
  - 73B-7
  - 74-7
  - 76A-7



# Current Injection Well Distribution

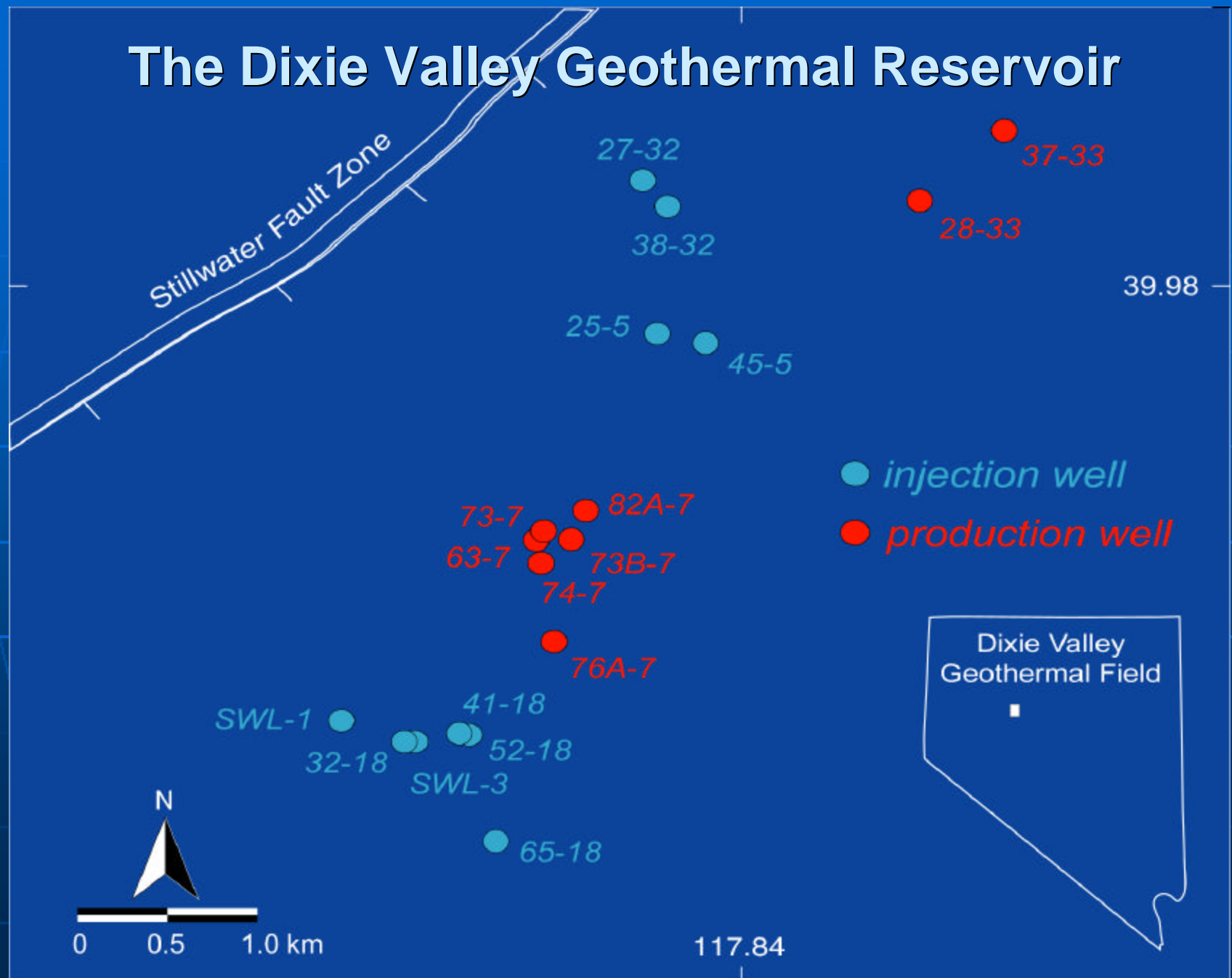
- 2 Section 5 Injectors 4500 gpm
  - 25-5
  - 45-5
- 6 Section 18 Injectors 3000 gpm
  - SWL-1
  - SWL-3
  - 32-18
  - 41-18
  - 52-18
  - 65-18

# Augmentation Injectors

- 2 Section 32 Injection Wells      2100 gpm
  - 27-32
  - 38-32



# The Dixie Valley Geothermal Reservoir









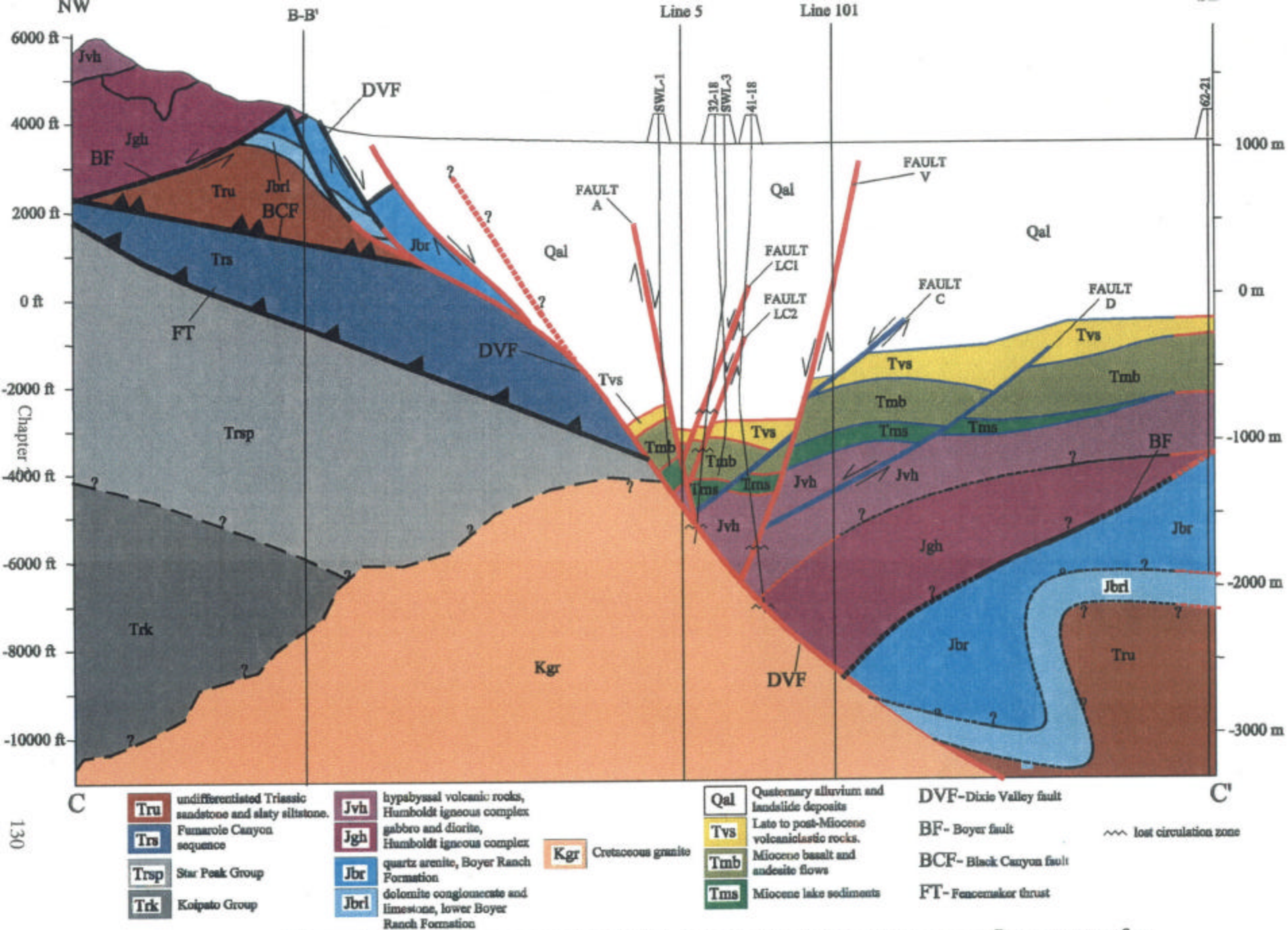
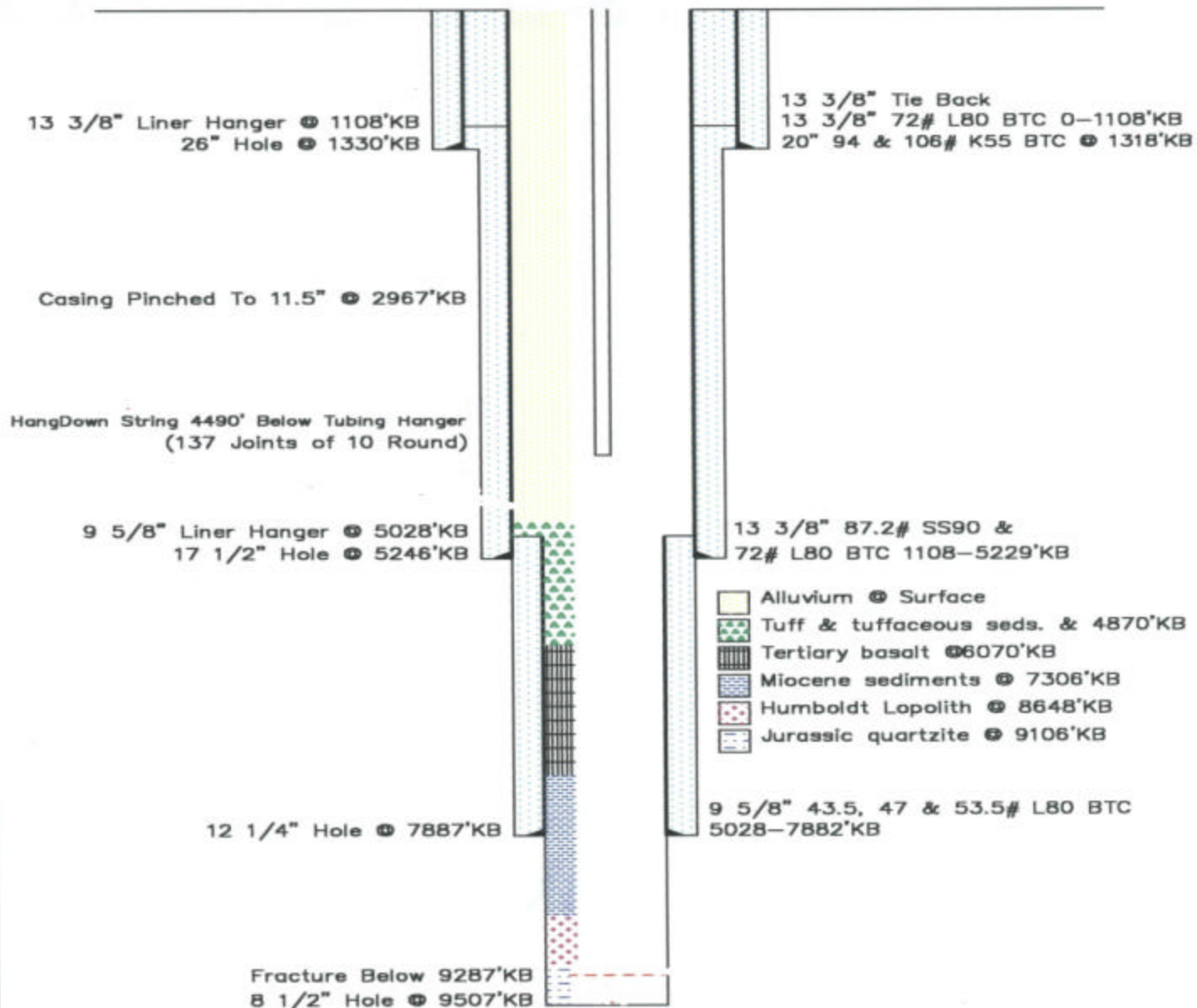


Figure 11a. Geologic cross-section C-C'a. The section incorporates a ramp-flat geometry for the surface of the Dixie Valley fault.








# Well Completion Diagram Well 28-33

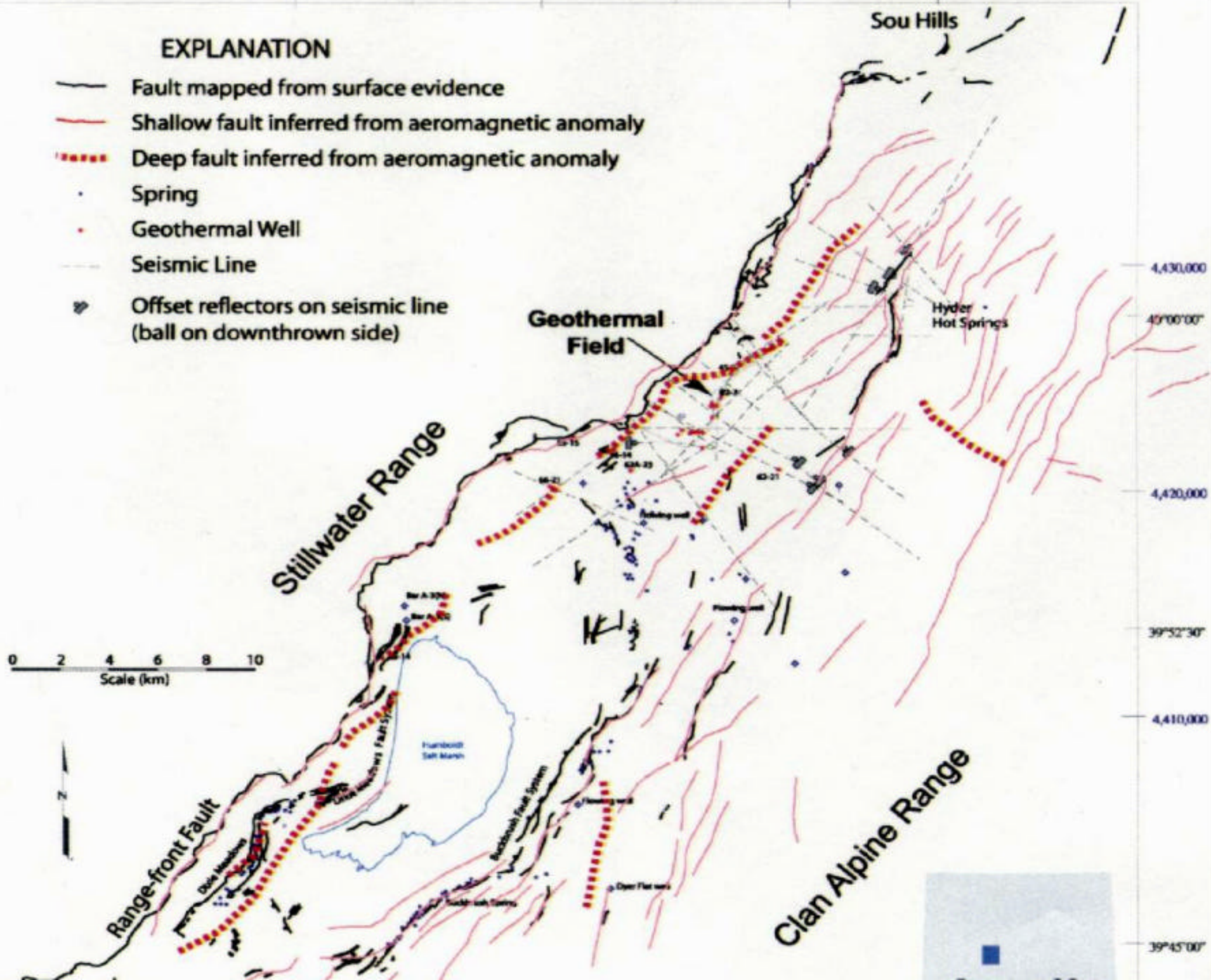
Location: SW-SW-SW Section 33 T25N-R37E  
Churchill County, Nevada  
Datum: 3501' KB, 32' Above Ground Level  
Drilled: 7/4/90 Veco Rig #10





### EXPLANATION

-  Fault mapped from surface evidence
-  Shallow fault inferred from aeromagnetic anomaly
-  Deep fault inferred from aeromagnetic anomaly
-  Spring
-  Geothermal Well
-  Seismic Line
-  Offset reflectors on seismic line (ball on downthrown side)







# Goals of Field Management

## ■ Sustainability

- Pressure Maintenance
- Efficient Heat Mining
- Minimize Wellbore Scaling
- Minimize Formation Damage due to Scaling during injection

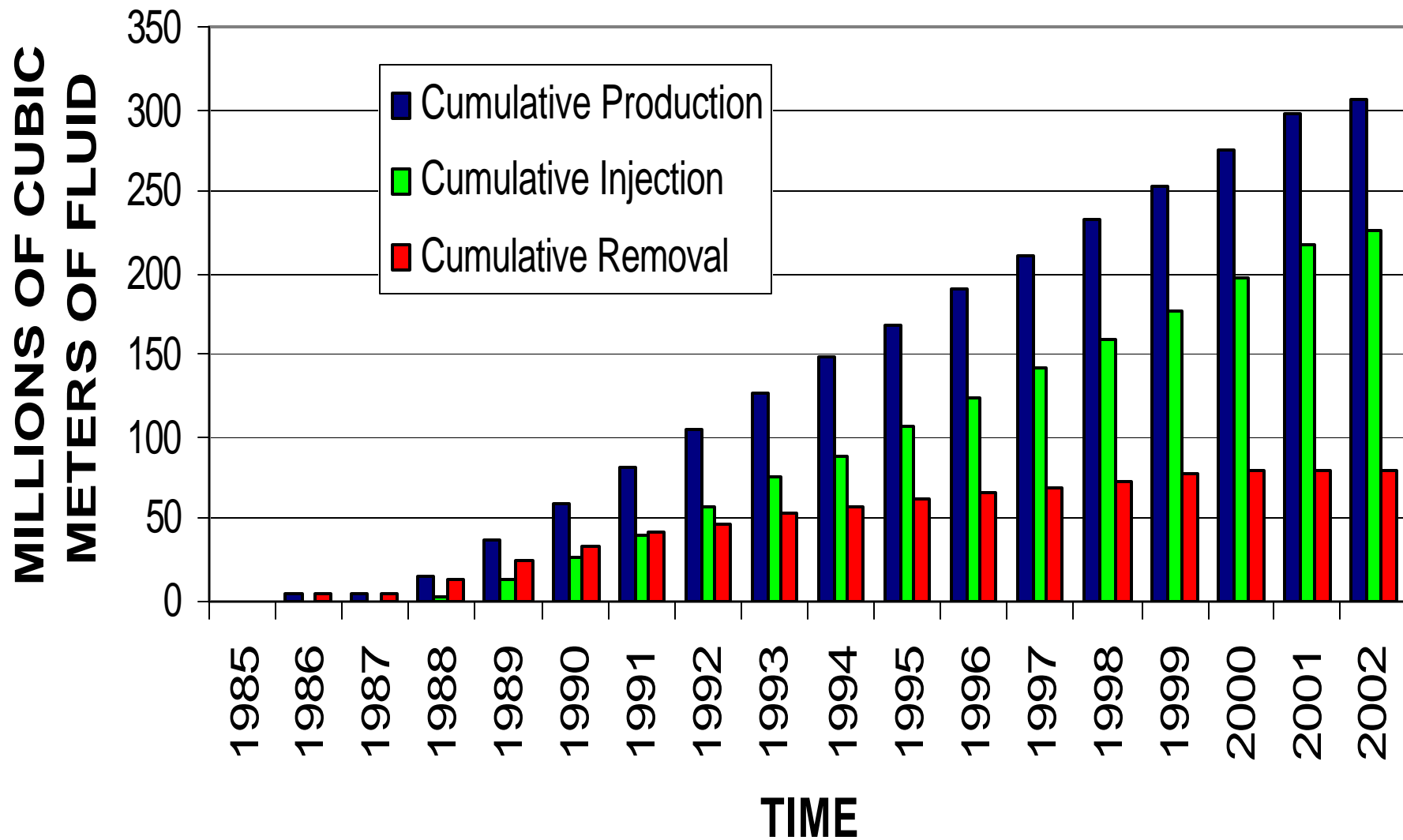
# Pressure Maintenance

- Cooling tower vapor loss
  - 20% of produced fluids
- Injection less than production
  - Natural recharge is minimal
  - Result is pressure decline in reservoir
  - Pressure decline induces production decline
- Augmentation with External Fluids

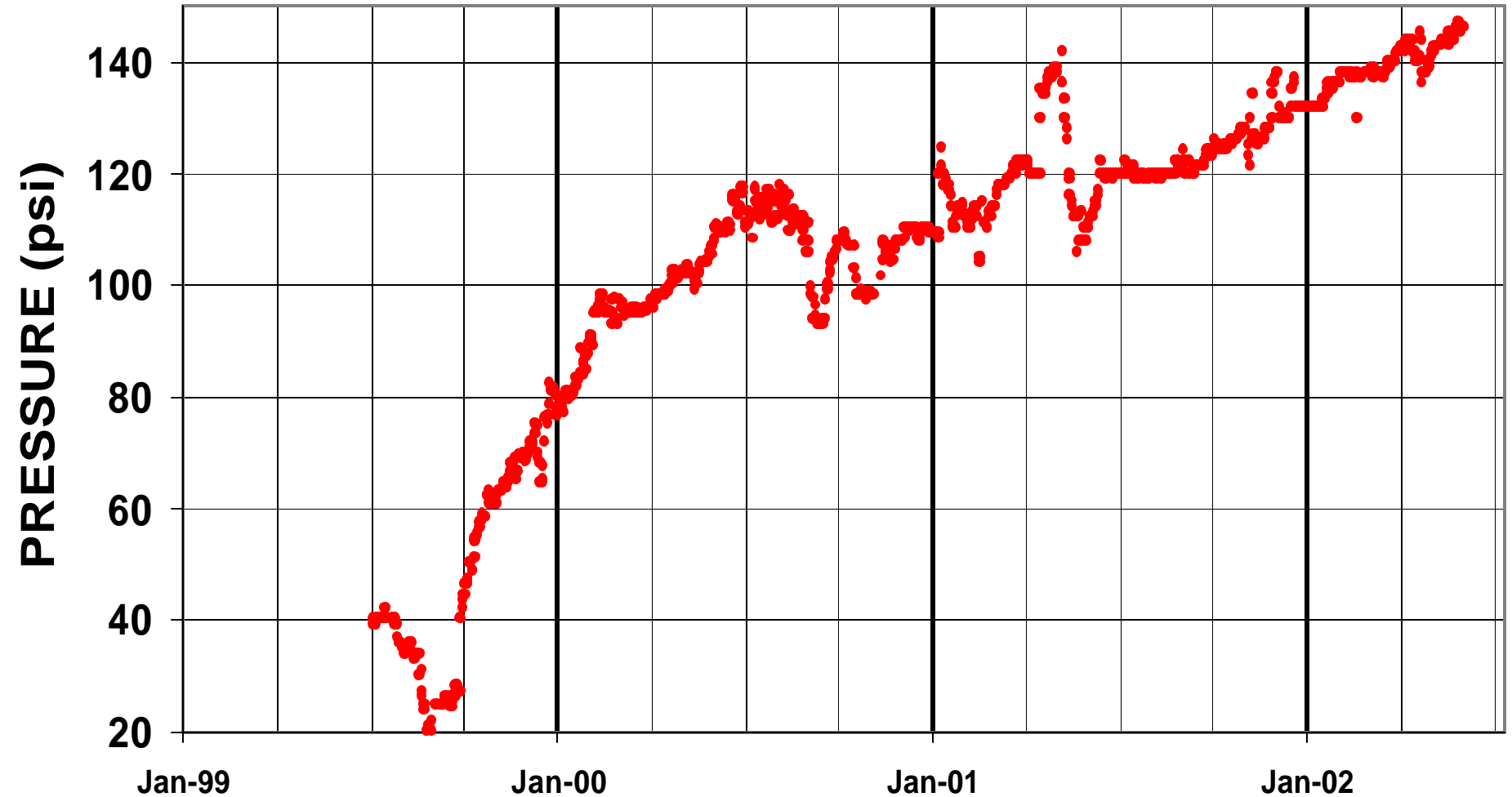




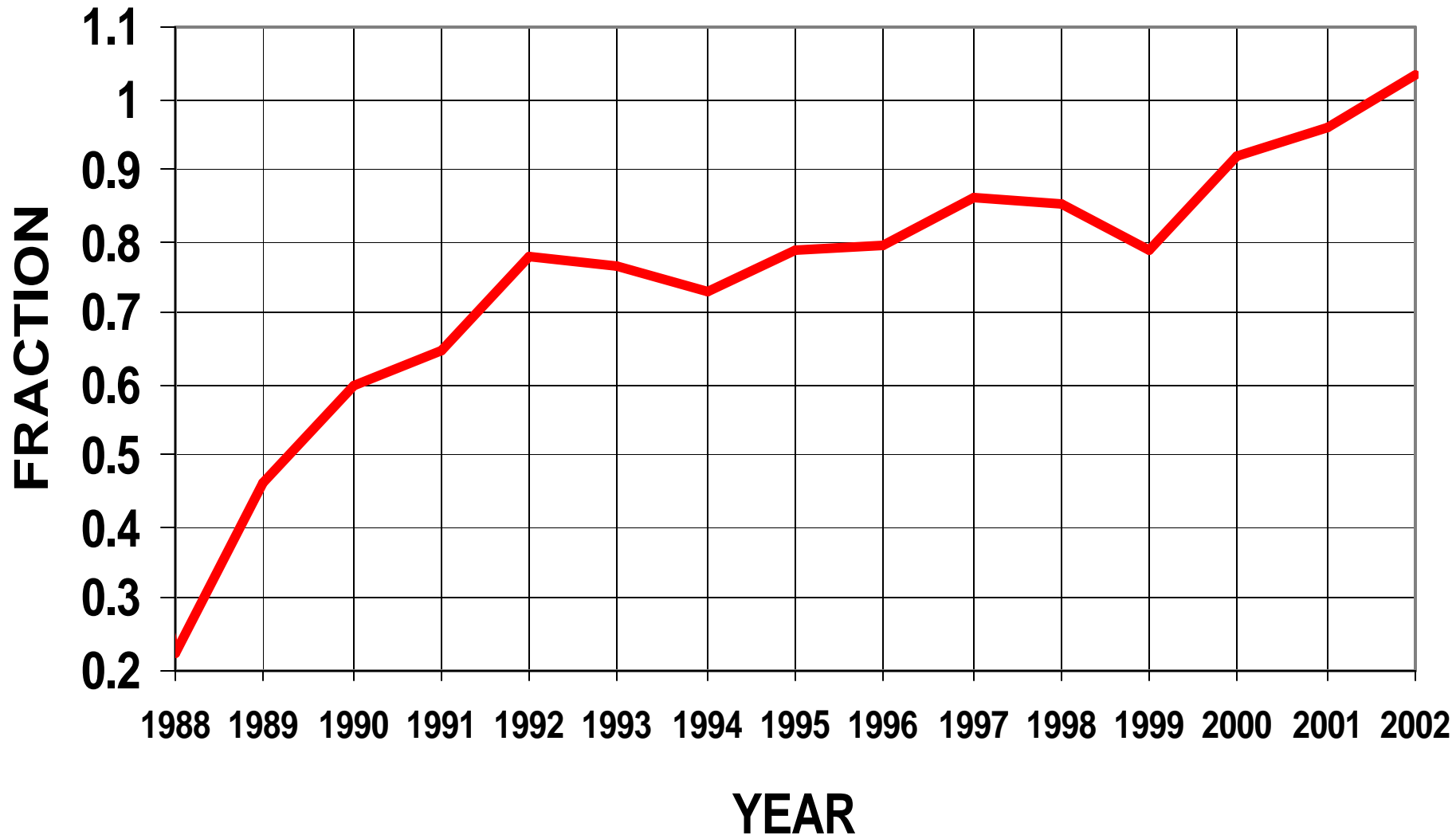
# DIXIE VALLEY PRODUCTION HISTORY



# Well 84-7 Reservoir Pressure



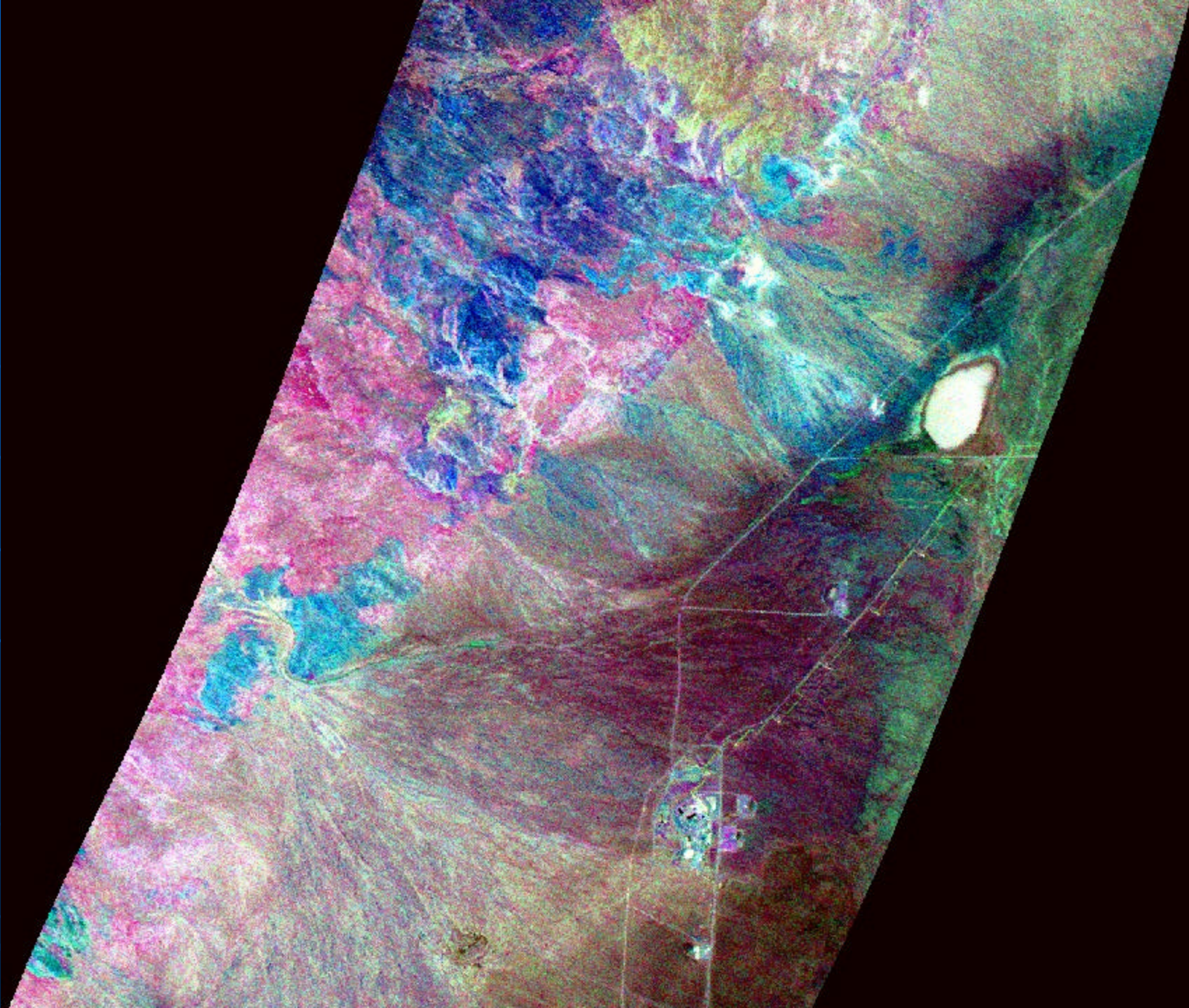
# FRACTION OF FLUID INJECTED



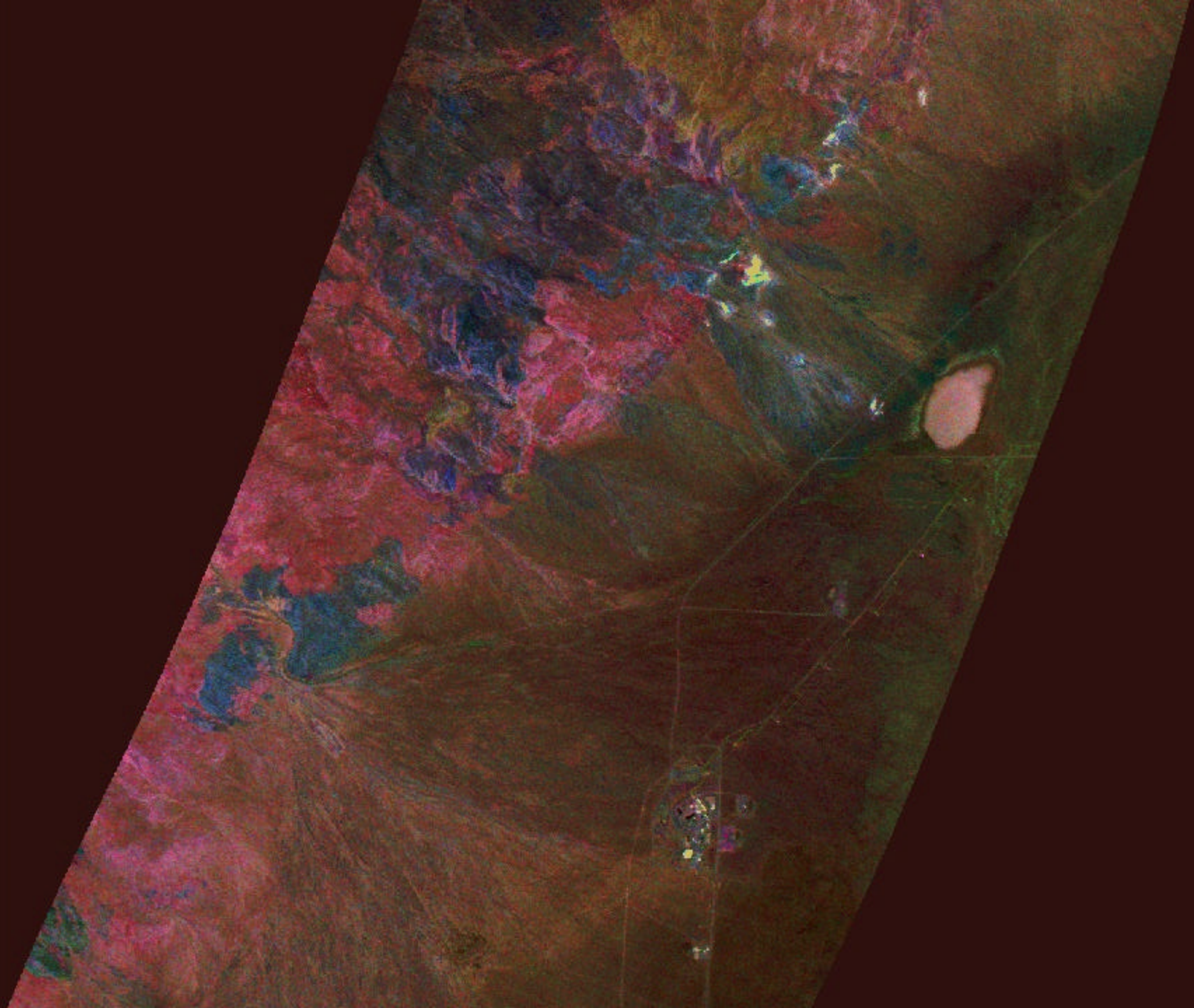


# Heat Mining

- Cold Injection Fluids can recycle to production zones
- Maximized return times are critical to efficiently mine heat
- Tracer testing to define:
  - Flow paths
  - Residence Time for reheating
- Search for Hot Rock





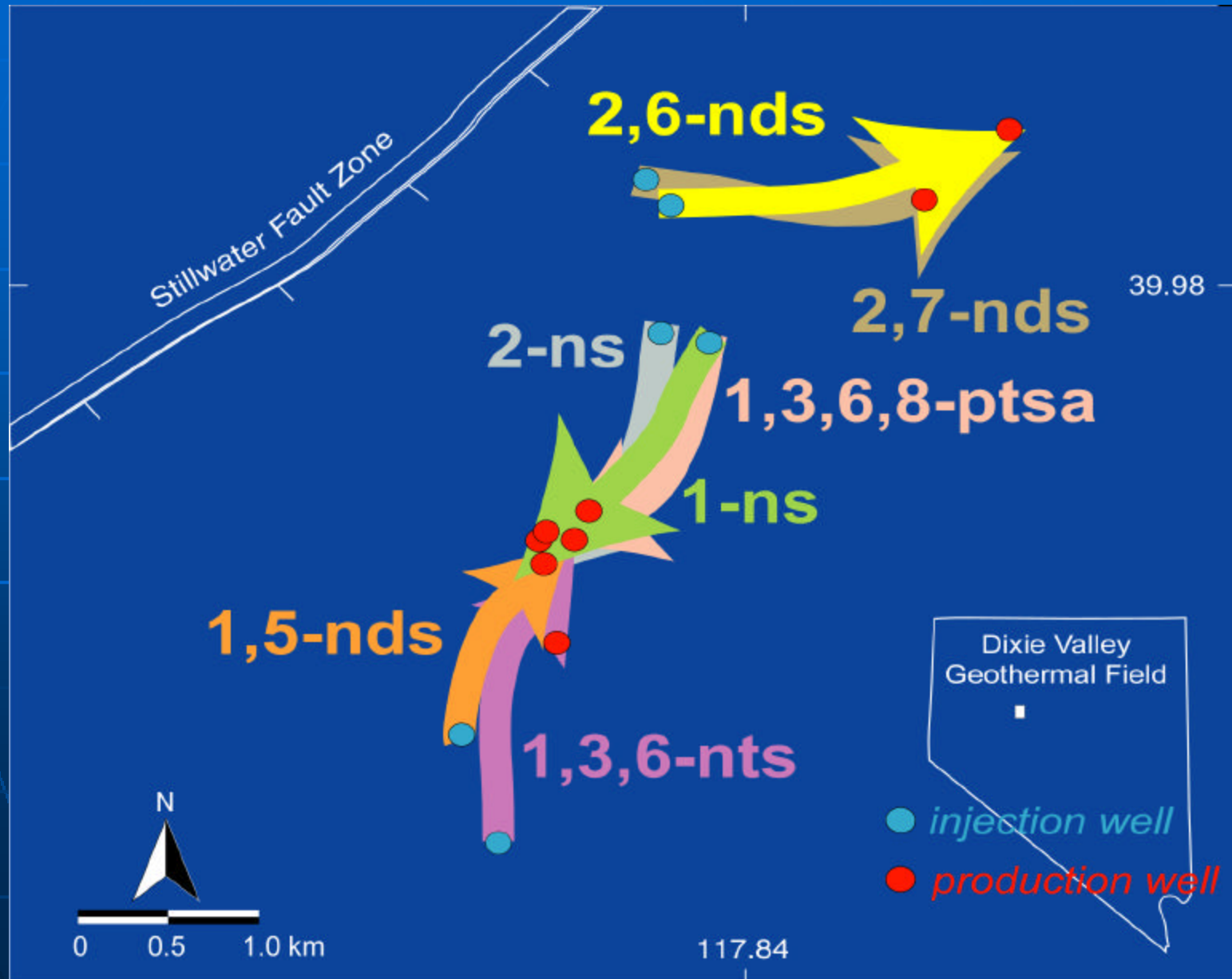








# Summary of Polyaromatic Sulfonate Tests at DV



# Mineral Scaling Management

- Mixing Models to predict scaling of injected brines or external waters
- Characterization of Scaling process and products
- Removal of Scale Potential
  - Threshold Inhibitors
  - Mineral Recovery



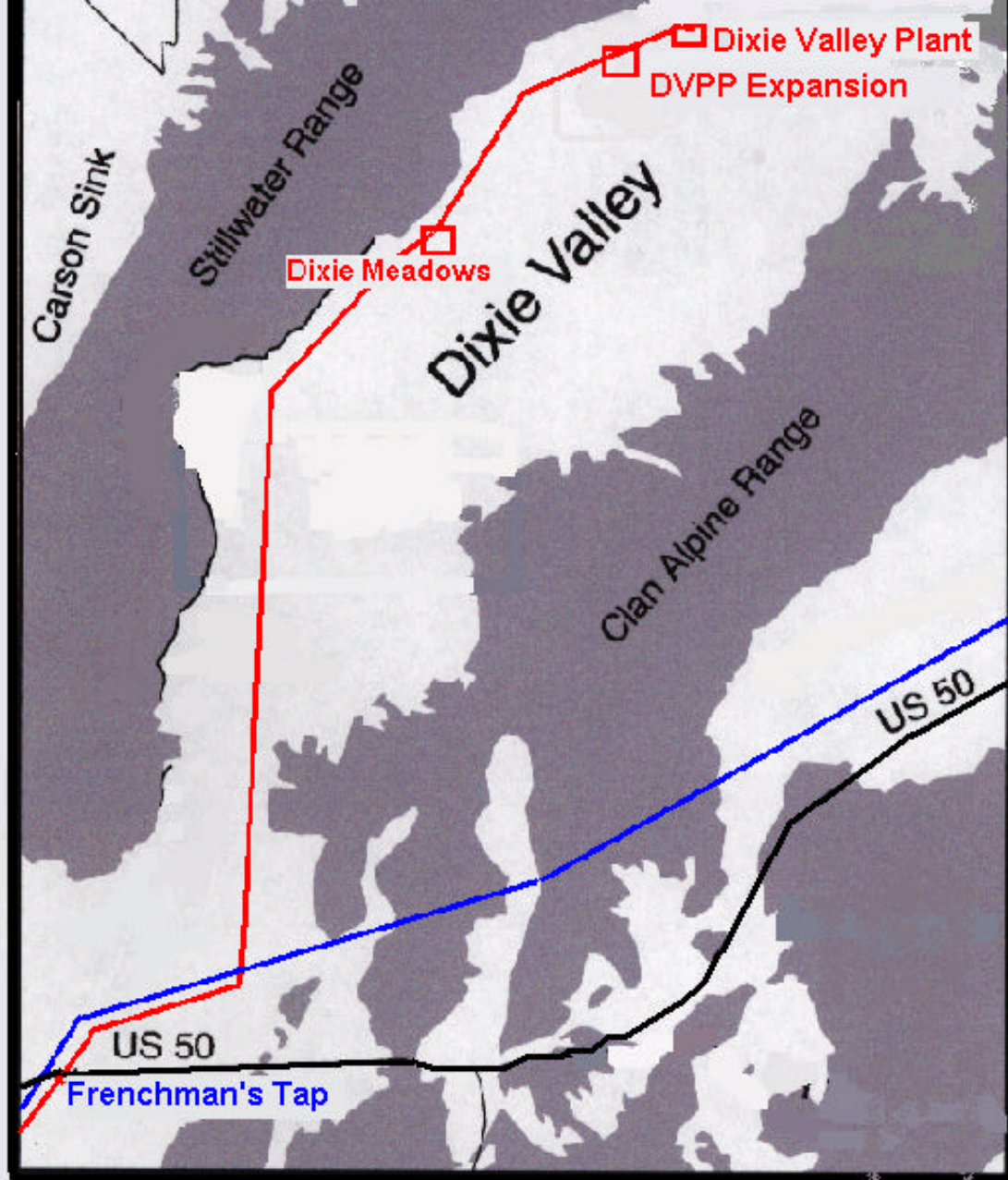




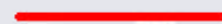




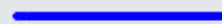




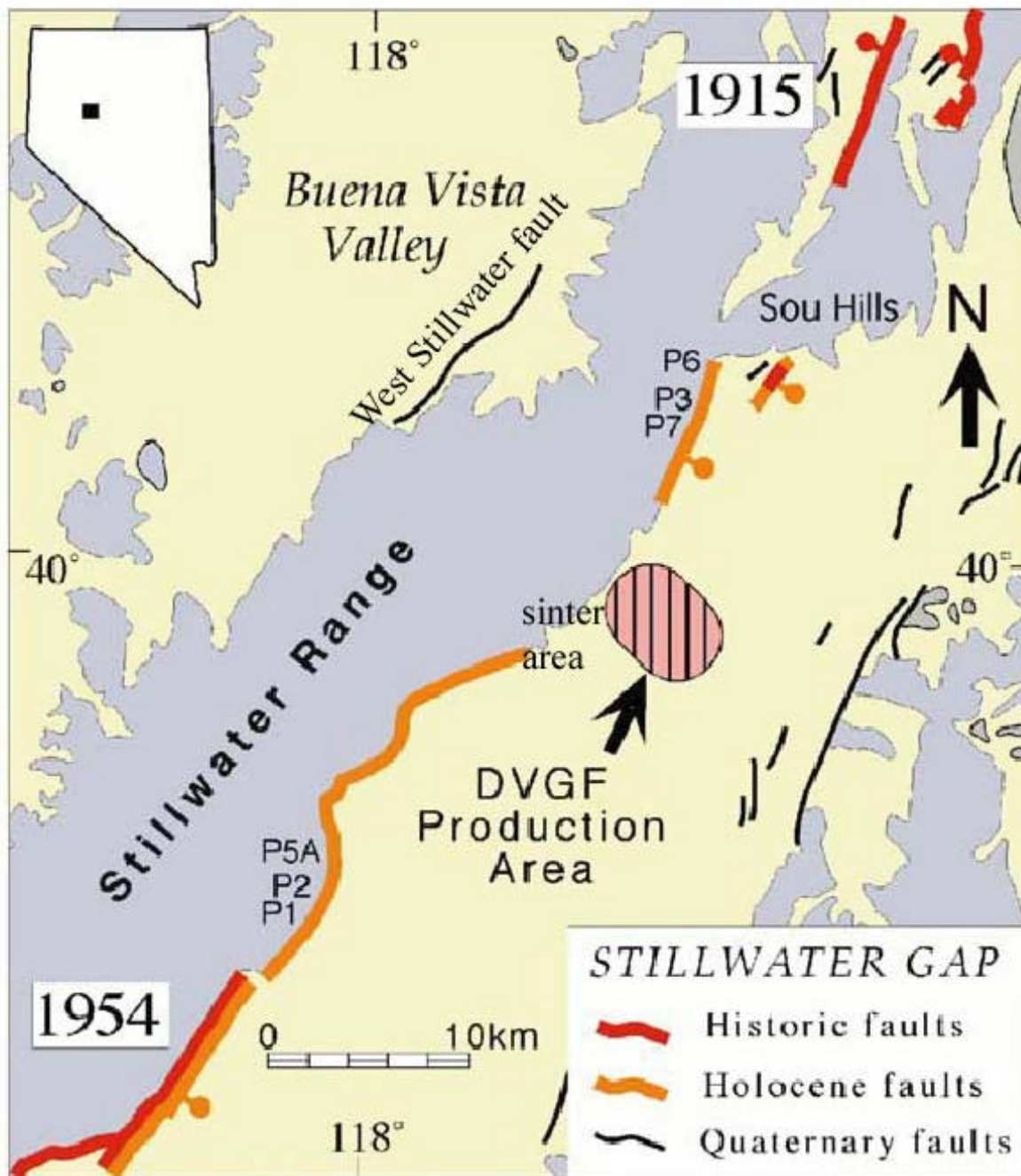
CAITHNESS 230 KV LINE



SIERRA PACIFIC 230 KV GONDER LINE





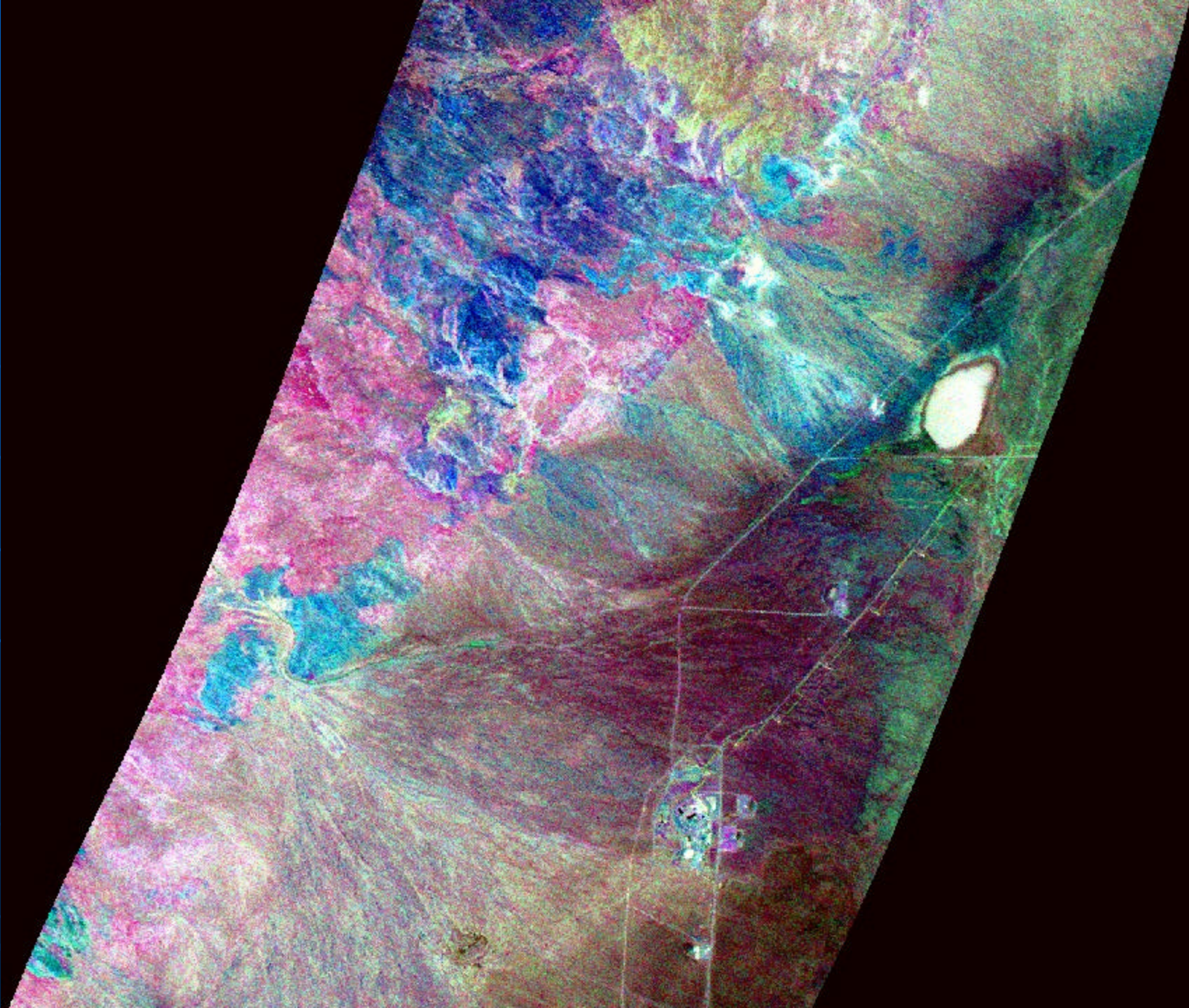


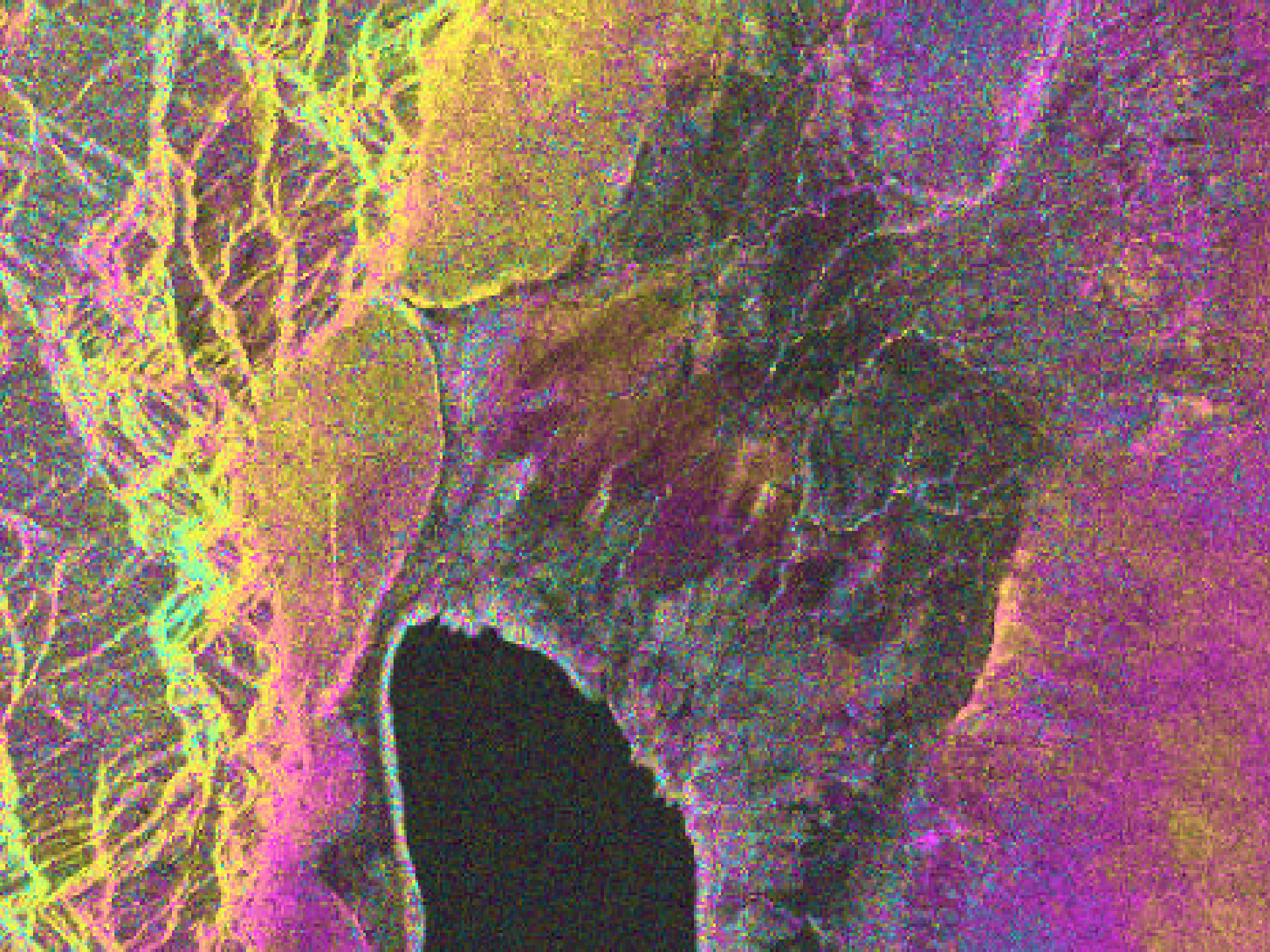
# Improved Mapping Tools

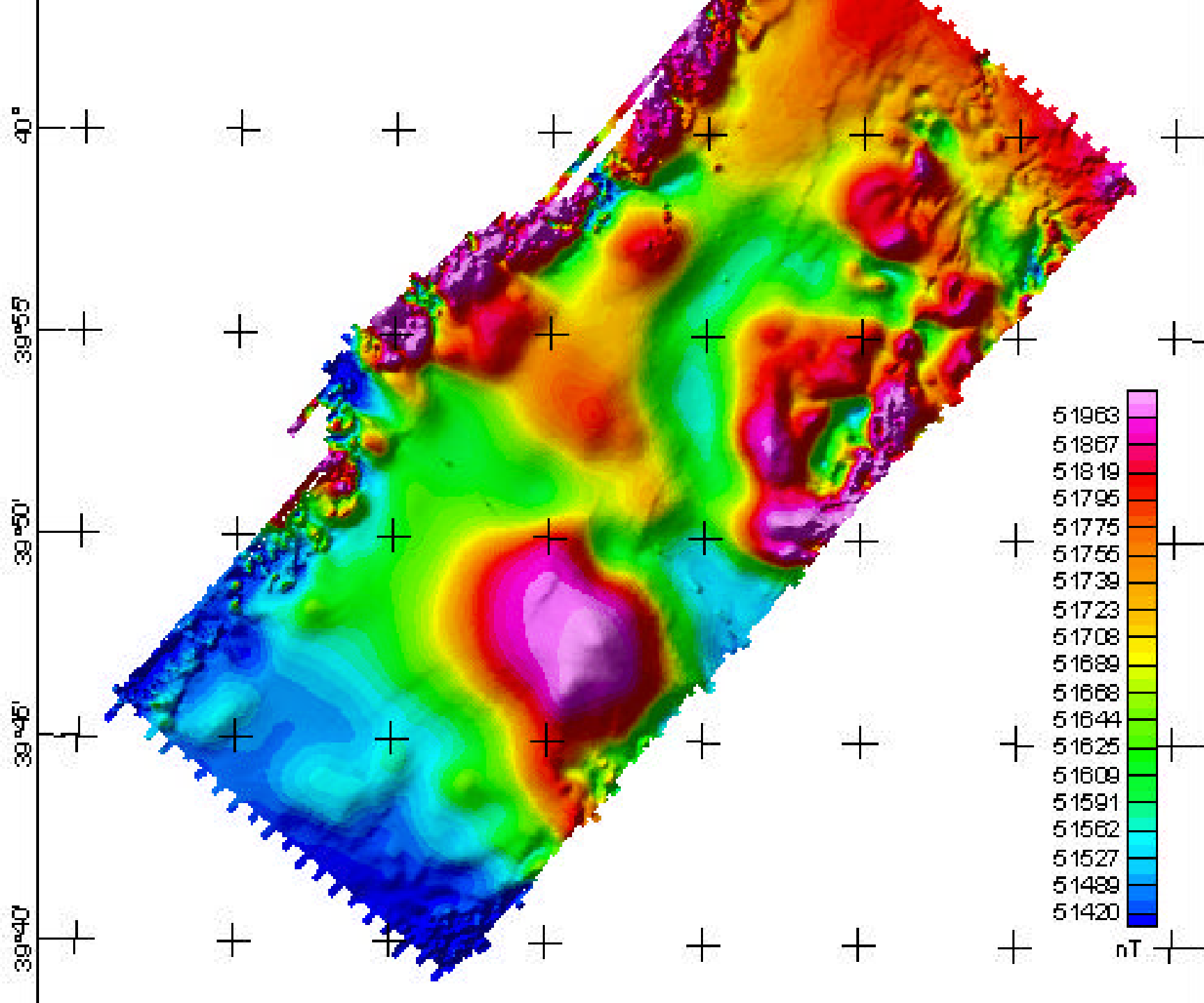
- Geologic Mapping
  - Remote Sensing
    - Infra-red
    - Thematic Mapping
  - Radar Imaging
  - Aeromag Acquisition and Processing
  - Gravity
  - Heat Flow Data Base
  - Seismic Analysis
  - Electrical surveys, MT, Geobilt














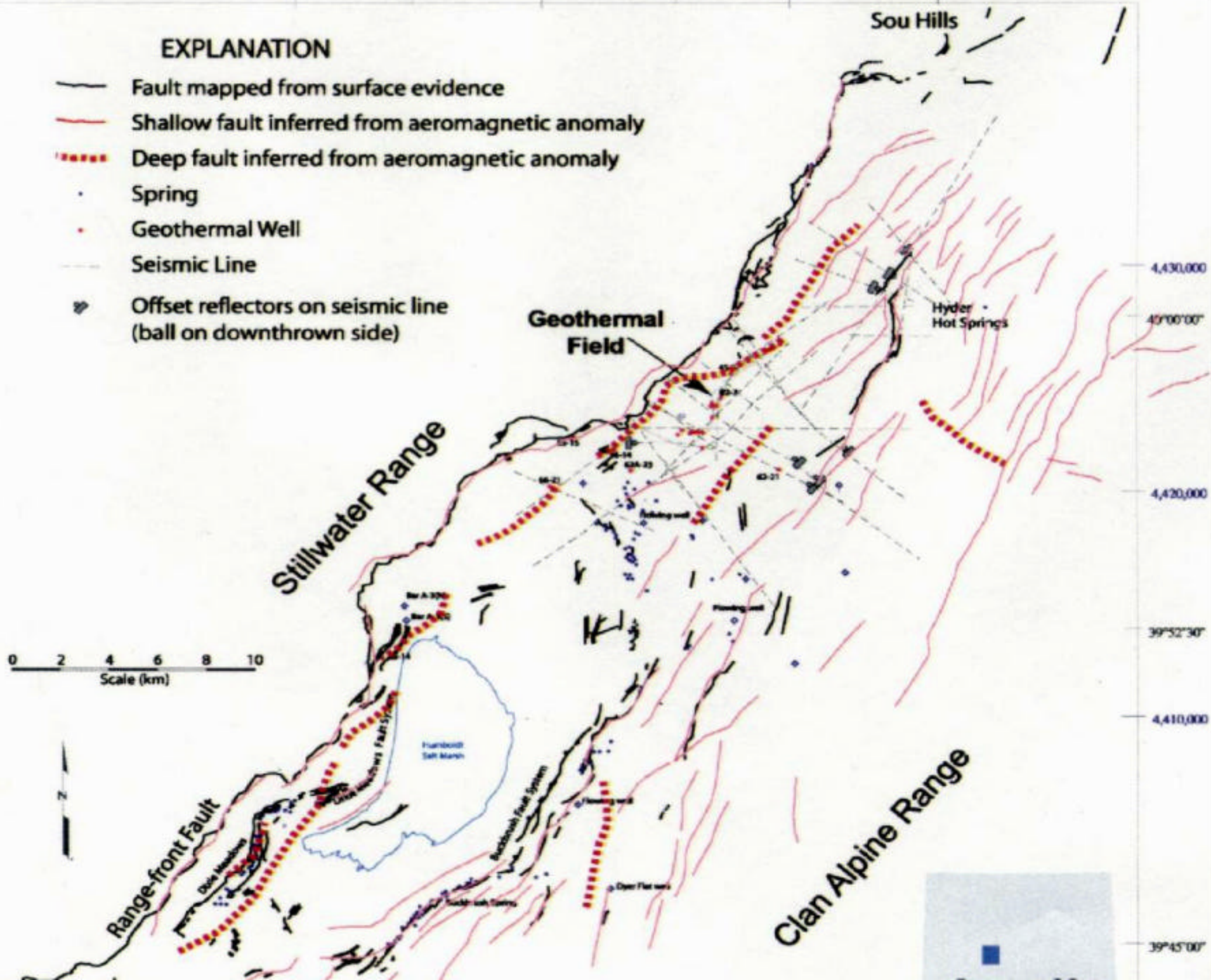






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# Dixie Valley as a Laboratory

- Simple one fault model
- Integrated suite of tools to develop conceptual models
- How will we step out to new targets:
  - Local
  - Regional Systems

# Controlling Structures

- What is pathway to production zones?
- What is nature of production compartmentalization?
- Are geothermal systems small and compartmentalized? Or
- Are geothermal systems analogous to the regional alteration systems found in Mineralized trends and belts?